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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/790,759

03/03/2004

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57810-088

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07/17/2009

EXAMINER

MOWLA, GOLAM

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

07/17/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/790,759	<b>Applicant(s)</b> MARUYAMA, EIJI	
	<b>Examiner</b> GOLAM MOWLA	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 19 May 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-11, 14, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-11, 14, 19 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **FINAL ACTION**

### ***Response to Amendment***

1. Applicant's amendment of 05/19/2009 does not place the Application in condition for allowance.
2. Claims 8-11, 14 and 19-20 are currently pending. Applicant has amended claims 8 and 19, cancelled claims 1-7, 12-13 and 15-18.
3. The amendment filed 05/19/2009 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Claim 8 and 19 add the limitation "wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) and a second peak having an intensity ( $I_2$ ) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is at least 0.48 and around 0.5," which is not supported by the original disclosure as filed. The original specification does not provide any support as to whether intensity ratio is "at least 0.48".

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Status of the Objections or Rejections***

4. The objection to the Specification is withdrawn in view of Applicant's amendment.
5. Due to Applicant's amendment of claims 8 and 19, all rejections from the office Action dated on 02/19/2009 are withdrawn. However, upon further consideration, a new ground(s) of rejection is/are presented below.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 8-11, 14 and 19-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 8 and 19 add the limitation "wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) (about 2.5) and a second peak having an intensity ( $I_2$ ) (about 5.5) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is at least 0.48 and around 0.5," which is not supported by the original disclosure as filed. The original specification does not provide any support as to whether intensity ratio is "at least 0.48".

***Claim Rejections - 35 USC § 103***

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
9. Claims 8-11, 14, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (hereafter "AAPA") in view of Neerinck et al. ("Depth profiling of thin ITO films by grazing incidence X-ray diffraction," Thin Solid Films 278 (1996) pp12-17), and further in view of Adurodija et al. ("Effect of Sn doping

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on the electronic transport mechanism of indium-tin-oxide films grown by pulsed laser deposition coupled with substrate irradiation,” J. Appl. Phys. 88 (2000) pp 4175-4180).

Regarding claims 8, 14 and 19, AAPA discloses (See Background of the invention; pages 2, lines 1-19; see also fig. 7) a photovoltaic device (fig. 7; page 2, lines 1-19) comprising:

- a first conductivity type or n-type single-crystalline silicon semiconductor substrate (n-type single-crystalline silicon substrate 101; fig. 7; page 2, lines 1-19) having a front surface (top surface on which i-type amorphous silicon layer 102 is disposed) and a back surface (surface on which back electrode 106 is disposed; see fig. 7) and receiving light incident from the side of said front surface;
- a substantially intrinsic first amorphous silicon semiconductor layer (i-type amorphous silicon layer 102; fig. 7; page 2, lines 1-19) formed on said front surface (top surface; see fig. 7) of said single-crystalline silicon semiconductor substrate (101), the substantially intrinsic first amorphous silicon semiconductor layer (102) consisting of a single layer (see fig. 7);
- a second conductivity type or p-type second amorphous silicon semiconductor layer (a p-type amorphous silicon layer 103; fig. 7; page 2, lines 1-19) formed on said first amorphous silicon semiconductor layer (102); and

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- a transparent conductive film (transparent conducting film 104; fig. 7; page 2, lines 1-19) consisting of indium-tin-oxide (ITO; page 2, lines 5-6), formed on said second amorphous silicon semiconductor layer (103),
  - wherein a collector (collector 105; fig. 7; page 2, lines 9-13) is formed on the transparent conductive film (104).

However, AAPA is silent as to the indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) and a second peak having an intensity ( $I_2$ ) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is at least 0.48 and around 0.5.

Neerinck discloses a double-layer structure transparent conductive film (see abstract) for use in optoelectronic application. Neerinck further discloses that the transparent conductive film includes an indium oxide layer (ITO film) (see abstract) having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks include a first peak having an intensity ( $I_1$ ) (about 2.5) (see fig. 1) and a second peak having an intensity ( $I_2$ ) (about 5.5) (see fig. 1) and the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is  $\sim 0.4545$  ( $2.5/5.5=0.4545$ ) (see fig. 1 of Neerinck).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the transparent conductive film of Neerinck in the photovoltaic device of AAPA because of its relatively low resistivity and high transmissivity to visible light (1:1-4 of Neerinck).

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AAPA in view of Neerinck teaches that the ratio ( $I_1/I_2$ ) is around 0.4545 and Neerinck further teaches that increasing the incidence angle ( $\omega$ ) increases the high-angle peak intensity (4:16-19) and decreasing the incidence angle ( $\omega$ ) decreases the high-angle peak intensity. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have performed routine experimentation by varying the incidence angle such that the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is optimized to allow for a layer with relatively low resistivity and high transmissivity to visible light as desired by AAPA in view of Neerinck (1:1-4 of Neerinck), since it has been held that discovering an optimum value for a result of effect variable involves only routine skill in the art. MPEP 2144.05 II (b).

However, AAPA in view of Neerinck fails to disclose whether said indium oxide layer contains Sn, and the content of Sn with respect to In in said indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight.

Adurodija teaches a series of composition for ITO films that may be used in "many optoelectronic applications, including flat panel displays and solar cells" (Introduction, first paragraph). Adurodija shows in Figure 4a that the carrier concentration of these films increases with weight % of Sn from 0-6 wt. % and then either decreases or levels off from 6-10 wt. % Sn. Thus, Adurodija et al. show in this figure that the maximum carrier concentration for these films occurs around 6 wt. % Sn. Adurodija et al. disclose in first paragraph of the introduction that high carrier concentration and low resistivity are optimal for use in solar cell applications as transparent conductors.

It would have been obvious to one of ordinary skill in the art at the time of the invention to choose a composition of the tin oxide layer used as the transparent conductive layer in the device of AAPA in view of Neerincx that is around 6 wt. % Sn as instructed by Adurodija in order to optimize the carrier concentration of the film.

Regarding claims 9 and 20, AAPA in view of Neerincx further discloses that said (222) peaks in Figure 1 of Neerincx et al. include: a first peak having an X-ray diffraction angle,  $2\theta$ , of about  $30.1 \pm 0.1$  degrees, and a second peak having an X-ray diffraction angle,  $2\theta$ , of about  $30.6 \pm 0.1$  degrees.

Regarding claims 10 and 11, AAPA in view of Neerincx further discloses that the ratio ( $I_1/I_2$ ) of the intensity of said first peak ( $I_1 = 2.5$ , in arbitrary units, according to Figure 1 of Neerincx et al.) to the intensity of said second peak ( $I_2 = 5.5$ , in arbitrary units, according to Figure 1) is  $\sim 0.4545$ .

### ***Response to Arguments***

10. Applicant's arguments with respect to claims 8-11, 14 and 19-20 have been considered but are moot in view of the new ground(s) of rejection as necessitated by the amendments.

Applicant argues that "the proposed combination of AAPA, Vink, Adurodija and Neerincx fails to disclose the limitations of claims 8 and 19 regarding "the ratio ( $I_1/I_2$ ) of the intensity ( $I_1$ ) of said first peak to the intensity ( $I_2$ ) of said second peak is at least 0.48 and around 0.5." (see Remarks, page).

This argument is persuasive and is moot in view of new ground rejection as presented above.



***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Correspondence/Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GOLAM MOWLA whose telephone number is (571) 270-5268. The examiner can normally be reached on M-F, 0900-1700 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ALEXA NECKEL can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/G. M./  
Examiner, Art Unit 1795

/Alexa D. Neckel/  
Supervisory Patent Examiner, Art Unit 1795